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Research Council of Canada

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sciences humaines du Canada

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THE SEASONS.

"KNOWLEDGE NEVER LEARNED OF SCHOOLS."

Edited by MISS ARMITT.

TREE-DESTROYING FUNGI.

BY MRS. DORMAN.

ONE is apt to indulge in feelings of resentment against those members of the vegetable kingdom who support themselves by no honest work of their own, but simply appropriate to their service the nutrient substances formed by the ordinary hard-working individuals of the community. It seems hard that the apple tree should be robbed of its juices by the parasitic misletoe, or that the wild thyme and flax should be strangled by the dodder that has nourished itself at their expense. So profitable does a certain parasitic plant of Sumatra (*Rafflesia Arnoldi*) find this mode of life that it can produce the largest flowers of any known plant. This gigantic robber, whose first discovered flower was nine feet in circumference and weighed fifteen pounds, held twelve pints of fluid in its cup. These three parasites may and do exhaust their victims, but do not actually promote disease. Very different is it with such as *Oidium Tuckeri*, the vine-mildew, and the other microscopic fungi that cause rust and smut and ergot in our cereal crops, for flowering parasites are, as a rule, far less injurious than cryptogamic. The more minute the enemy as an individual the more are his ravages to be dreaded collectively; man can protect himself without much difficulty from beasts of prey, but in the presence of an invading army of ants he is powerless, and can only wait till they take themselves off.

It was long a point of discussion as to whether fungi were the cause, or only the accompaniment of disease in plants, but it has been decided in favour of the former alternative, because it has not only been proved that the same fungus always accompanies the same disease, but it has been shown by experiment that these diseases are contagious, and may be induced by sowing the spores of the particular fungus upon a healthy plant. The higher orders of vegetation appeared in the first instance upon the débris of vegetation of a lower order, such as algæ, fungi, lichens and mosses; but, as Figuier remarks, when plants of a superior order are struck by death they become a prey to the humbler thallogens, and sometimes even during their life these parasites attach themselves to them and ultimately destroy them, as in the case of the Tree-destroying Fungi. To produce and to destroy is, he says, the double mission of thallogens, but on two conditions—an evanescent and short existence, and to multiply themselves to infinity and with great rapidity. Some mushrooms are said to produce 600,000 cells a minute. So rapidly do the more conspicuous fungi appear and disappear under the favourable conditions of autumn, that many persons suppose they are peculiar to that season, but in fact they are developed all the year round. For the greater part of the year perhaps, their life is a hidden life, but unceasingly they are preying in secret upon the tissues of some living victim, or hastening the dissolution of an already decaying organism, and their presence is manifested by the rapid and sudden development of the receptacle, the most conspicuous part of a fungus. In the case of trees, the so-called mycelium penetrates the wood-cells, softens and disintegrates them, thus producing disease, and ultimately death. The vegetative body of a fungus consists of a number of very fine interlacing filaments or hyphæ, which are commonly entirely buried in the tissues of its host or of some organic substratum. These filaments pierce the membranes of other cells in order to live on them and in them, and the reason is apparent when we consider the entire absence of chlorophyll in fungi, for as they cannot build up organic compounds they must obtain them ready-made. They cannot derive carbon direct from the carbon-dioxide of the atmosphere, but are dependent on substances already organized, consequently all fungi are either parasites upon other plants or animals, or are saprophytes on decaying organic matter. On germinating, the spore of a fungus gives rise to the mycelium or spawn, which buries itself in the tissues of its host, and from it rises into the air a body composed of densely packed hyphæ known as the receptacle. Everyone is familiar with the receptacle of the common mushroom; with its stout stem supporting the cap or pileus under which appear the pink or brown characteristic gills, upon which are formed the spores; but the *Polyporei*, the most deadly enemies of trees, instead of gills, have the under surface of the hymenium perforated by myriads of little holes. If the hymenium be divided into two halves, it will be seen that the flesh of the cap is thick and solid, and that the under part is composed of slender tubes closely packed side by side, and their mouths corresponding to the holes covering the surface. The spores are formed within the pores.

These fungi are often hard and woody; they have a very short stem, usually on one side of the hymenium, and may be seen growing in dense layers on the stumps of old trees. *Polyporus sulphureus* is a common fungus on the trunks of trees such as poplars, beeches and willows. *P. ignearius* is another, and *P. dryadeus* is the special enemy of the oak. Each tree has its own peculiar fungus. *Polyporus betulinus* grows upon birch trees, and another species on the larch; *Agaricus ulmarius* supports itself at the expense of the elm, and *A. ostreatus*, or the oyster fungus, is found upon various trees. *Polyporus squamosus* is a familiar species upon decaying ash trees, and occasionally attains enormous dimensions, such as seven feet in circumference, with a weight of forty-two pounds. According to Dr. Greville, this size was attained in four weeks, giving an increase of growth equal to nineteen ounces per day. Another reached a diameter of eleven inches within the space of a week.

Another class of fungus is the cause of the serious disease of gangrene or canker, which so commonly attacks apple and pear trees in damp or unfavourable conditions, for it must be noted that excessive moisture is a predisposing cause in all fungoid diseases. The spores of the fungi are in this case the *exciting* cause of disease, but it is believed that some change is first produced in the cells of the plant which enables the spores to find a nidus. The cellulose is first transformed into "a muddy fluid, a brown humus-like powder or a carbonaceous mass," and the disease then assumes a peculiar type, because of the presence of the fungus, often a species of *Nectria*. Gangrene may be moist or dry according as the product of decomposition is fluid or solid. Dry gangrene usually attacks the innermost layers of wood, and a sound appearance may be kept up outside until the disease reaches the cambium layer, when death quickly ensues. External injury is doubtless a frequent means of promoting fungoid diseases, and as noted above excessive moisture is a predisposing cause. There is a fungus called Coleosporum which is a great enemy to the leaders of pine trees, and often destroys them entirely. When timber has been felled or when stumps are left in the ground, the processes of decay and decomposition are aided by the ubiquitous fungi, and viewed under this aspect their effect is entirely beneficent, for by the disruption of the organic compounds in dead plants, their carbon and nitrogen are given back to the atmosphere for the further use of vegetable life, and if there were no putrefaction and decay, so much carbon and nitrogen would be locked up, and the earth would become so cumbered with dead organisms, that life would be rendered impossible. Schoolboys are well acquainted with the delights of touchwood, which is caused by the mycelium of a fungus permeating the wood of an old stump, and exhibits phosphorescence in the dark. The mycelium of fungi picks timber to pieces as men pick oakum, and dry-rot is the result. Unfortunately they do not confine themselves to the disintegration of dead wood, but attack living trees and felled timber, and thus produce a dread disease called dry-rot, because it reduces its host to dust. Its cause, however, is not dryness, but excessive moisture, and *Merulius lacrymans* is often dripping with water, though its tears do not hinder its work of destruction. Other fungi injure trees by destroying or interfering with the normal action of their leaves; of such is the coffee-leaf disease, and many others, chiefly known as mildews. Numbers of species are found in woods, but as they are chiefly nourished by decaying matter they, perhaps, are not the cause of injury to the trees.

It may be noted here that the green colour of one of the woods used in the manufacture of Tunbridge ware is due to the presence of the green mycelium of *Helotium druginosum*, which traverses the whole fabric of the wood. It attacks fallen oak branches, and is not very common. It seems curious that the mycelium should be green, and one wonders what gives it the colour since it cannot be owing to chlorophyll.

VERONICA CHAMASDRYS—GERMANDER SPEEDWELL.

BY MRS. USSHER.

This plant has different dresses for sun and shade. In dark damp places the leaves are often a dull brown-green with purple veins, and the whole plant is very hairy. The colouring matter, which shows as brown and purple in the leaf, is able to change what scant light the plant gets into heat, and the hairs turn the wet and prevent the web and woof of the plant from getting water-clogged. The dark flowers grow in a spray which springs from the base of a big leaf. Each flower of the spray springs in its turn from the base of a tiny leaf, so dwarf that it seems, towards the tip of the spray, to be little more than a hair. The seeds often shrivel—it is only here and there that one of them manages to swell big, and even so, it does not always fully ripen from want of sun. Now compare a plant growing in a place which is only half-sheltered—say a grassy tussock where the tufts break the sun-rays and draw up the Speedwell stems. The brown and purple has vanished from the leaves—they are warm enough without it: it comes, like the pink flush on daisies, to cold cheeks. These comfortable leaves are a full rich green, and the flowers, too, are no longer so purplish, but a fuller, often uncompromising blue; and the seeds for the most part ripen.

But who would guess that this shy little beauty is the same as she who litters her gaudy robes of red, yellow and orange leaves with flashing gems of coldest, clearest blue? This is the way she shows herself off on bare waste ground, where there are no rivals to be jealous of her brightness and nobody to look down on her except the sun, who is altogether too high to matter—his condescension is a compliment! Look at her trailing her skirts—the leaves cover the ground as completely as those of the periwinkle tangle you saw the other day; it is the leaf stalks this time which throw themselves back to the light. At first you will say, "But there are no leaf stalks." In the shade this is sometimes almost true, but here there is enough pivot to turn on; and where the leaves continue to grow in opposite pairs, the leaf which by rights would have to duck under the trailing shoot right into the soil, twists upwards instead and lays itself over the upper surface of the stem. This is the very place where there is most room and light for it. But very often, especially towards the end of the stems, you find the plan of opposite leaves has been quite given up by the plant. Instead, the leaves grow, turn about, and from the base of each springs a flower on a long stalk. The seed vessels ripen quickly; they hurry through their green clothes and put on a rich yellow-ochre dress—but they are not used to so much finery—presently they are ashamed of it, hang their heads down and the seeds drop into the soil. Or, perhaps, some breeze catches the rim, and its current gets under the broad flattened side of a seed and buoys it up and floats it away, like some small raft, to new moorings. The seeds have a good chance in these sunny places for the insects come galore; the flowers are not so large as those you saw in the shade, but they are set off grandly by the bright, burnt leaves. Nature is aware how well her four blue signal flags can be seen at a distance, and instead of filling four dust bags,[*] as she does for most of its relations, she only fills two for the Speedwell. The (dust) threads[†] stand out sideways from the flower, and as the dust shoot[‡] projects straight forward, the flower seems entirely dependent on insect visits. Every preparation is made for the latter: the dust shoot is in readiness and the dust[§] fit to go down it all at the same time, and dark blue lines running into a central white spot show the way to the honey. The latter is to be found in a yellowish fleshy place right in the bottom of the flower, and is kept dry by a roof of hairs. The insect lights on the lowest blue leaf, along which the dust shoot lies. He holds on by the dust threads to prevent tumbling off, but by doing so he unconsciously gets loaded as dust carrier; for the bags are dragged underneath him, and his waistcoat becomes powdered with dust, ready to supply the shoot of the next Speedwell to be visited. Sometimes, if an insect lights on one of the blue side leaves (instead of the bottom leaf as above) one of the dust bags gets drawn against him, but this is not always certain to happen.

When does the flower open and shut? At Innsbruck, Linnæus watched it come out between nine and ten in the morning and go to bed between five and six in the evening. Perhaps this opening and closing not only keeps the flower warm and dry but makes it less dependent on insects than seems at first the case. By closing, the dust bags would be brought nearer the dust shoot. During long rainy days the flower may be feeding its own seeds.

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[*] Anthers. [†] Stamens. [‡] Pistil. [§] Pollen.

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NATURE NOTES FOR OCTOBER.

The phenomena of the seasons have no exact monthly line of demarcation. The early days of September show the same sights of nature as the latter ones of August. Then do grasshoppers chirp loud, and solitary bees stand buzzing in woodways, and winged ants swarm upwards on stem of polytrichum moss in the wood, or crawl by thousands in dusty wood-side road, intent on their so-called marriage flight. Then do Pied Wagtails congregate by the dozen, running nimbly round the cattle of the pastures, where flies abound; and flocks of Missel-thrushes most warily scour the margins of the fell land and heather. Then do Meadow-pipits in parties betake themselves to the flowery billows of that heather, where the Curlew is no more found, and where insect life below the waves is plenteous; and there rise, from picking the tiny succulent seed, with sweet cries of *si-sip-sipit*. Then does the ivy, that of all the trees and herbs of the north loves to do the contrary thing, begin to put forth those blossoms that will open by-and-by, making of their autumn a spring of its own. Then does the oak tree suckle upon its leaves thousands of minute white grubs, either within the minute spangle galls that bespatter them, or the big ruddy-growing cherry galls. Then do Rooks grow jocund, and call and clamour, with high hilarious double notes, gambolling in the air, flinging themselves down precipitate from a height to catch up with a side-way turn that is almost a somersault.

All birds show joyousness in bright September days, when the moult is over (indeed some show it before this happens, and funny it is to see a Pied Wagtail chirrup and wag his hinder parts where a tail should be!) and the seed-harvest is plenteous, and each bird is for himself alone in the getting. Besides, for many species there is the journey southward in question, and the instinct of movement awakens. So while summer, that fled precipitate before August rain and chill, comes back superb in days of sunshine and nights of moonlight, all birds go about their business with sounds of pleasure. The Marsh Tit eats the seed of the spear-thistle, whose matted hoary polls stand waiting for a wind, with cheery *zip-zip* calls. The Black-cap Warbler and the Robin keep picking the elderberries one by one as they ripen; and the Starling drops from his early song-perch to breakfast upon them. The Throstle, silent by exception, springs about the yew-tree to catch its berries. The Titmice sport about beeches, where nuts ripen for the Great-tit and for the Coal-tit (whose spring cries sound from the shade) and where leaf-supply of aphides still holds out for Blue-tit and for Long-tail. The Gold-crest sings as it flutters after gnats; the Chaffinch essays to sing, but cannot get beyond four notes or so; Robins wax exuberantly eloquent, and the Dipper by the beck begins his song again.

And while all this goes on, the excitement and expectancy of the Swallows grow. When shall they start? How many more of lagging nesters shall they wait for? During the sunny days they gather and increase; the air is full of their sweeping forms, of their cries and calls and songs—for Swallows have a performance that must be classed as song. They alight in concourse first on a wych-elm—no reeds or telegraph wires being handy,—whose top-most twigs have been worn bare of leaf by heavy-footed Rooks. There they swarm, Swallows settling on bare bough, and Martins poising on leafy end, till they find a bare old larch that suits them better, where they may hold noisy parliament. The climax comes one glorious morn (the 14th) when valley mist below makes upland sunshine (that lights the dew to brilliance) doubly glorious. The old larch tree is all vocal and animate; hovering wings fold themselves into still and twittering forms; rows of white breasts shine along the boughs, tier above tier, bathed in sun rays from the east. Then suddenly, they fling themselves on air, swarming, calling, sweeping round. It is a wonderful sight! Next morning, of that great concourse, not a Swallow is visible; there is a lonely feel in the air. One band at least has started for the great trip south, though many a Swallow has yet to go, and it is long before we shall look for the last one.

Then comes October, that has beneath its risks of weather, perhaps, greater possibilities of beauty than any other month in the year. Superb in sunshine, with its ruddy fruited hedgerows, its trees of red and yellow, pink and bronze (each an individualized mass of colour) its mountains of gold-brown bracken slopes below, and blue-lined sweeps above, softened, etherealized in mist; how superb! But in cold and wet, with damp smell of falling leaves, how cheerless and chill the month may be!

But it is in October, when summer finally drops her mantle, and the trees wait in naked preparedness (all their forces ingathered and wrapped tightly up for winter) the resurrection of a new spring, that our true English birds may be most easily seen and learnt. For how can birds be correctly called English that will not bear the worst of England's weather, but like rich and idle people, seek a foreign land for warmth? And when the delicate hordes are gone—all the host of Swallows, and Redstarts, and Fly-catchers, and confusing, closely-allied Warblers—the October landscape is left free to our few hardy, home-staying species. Some Swallows do, however, linger on, according to their nesting fortunes, through the month. I saw this year, on the 7th, a brood of Martins but just on the wing, and another still in the nest—a date of most risky lateness, though the continuous fine weather was favourable to the flight of young birds. It reminded me of a sight I once saw, of a Martin feeding its young from the 23rd to the 28th of September, in the face of terrible north-west gales and squalls. The nest too, was perched on a huge sea-cliff, from whose iron-stone sides, unsettled by the rain and wind, the stones came down with a continuous rattle, missing, however, the little mud cradle that was within a slight cavity. I wondered if that brave, solitary parent succeeded in bringing out the twittering fledglings that held it bound to the wind-blown spot.

But when such summer friends are all flown, how conspicuous become suddenly our winter birds! The Robin, all at once, is ubiquitous. He is everywhere, hopping by the rich road borders, where brambles trail in blackening fruit and reddening leaf (bright as his own breast) and the little strawberry leaves begin to make a mosaic of colour; following his mate coquettishly, perching, while he sings his delicious ditty, on the most conspicuous post he can find, and singing too, on the warm days that excite eloquence, all the day long. Then he grows bold with the first touch of cold, enters the open windows, perambulates the quiet rooms and makes his exit at his own sweet, unfluttered will. There is no art in knowing the Robin, or the Wren, or even the little modest red-legged accentor of our gardens; none in descrying the cheery Wagtails that consort on church roof; not much in making out the bands of Missel-thrushes and of Meadow Pipits that still patrol, before the on-coming of the Fieldfares, the rough fell lands. But there are half-a-dozen or more species, sufficiently common, that are not so well-known, and which, yet, with a little care, can be easily noted. I would advise the intending ornithologist to wait at all times on his ear. That organ is of even more service to him than the eye. It gives the signal, in the faint but perfectly decisive voice of species, of the presence, close by, of the yet unseen bird. After the signal is caught, some small caution and a little wait will show the feathered morsel to the eye. In quiet woods, a soft *zee* sound, rising and falling, betrays the whereabouts of the Goldcrests. They flit in a small family party with butterfly-spotted wing, and seldom-seen yellow head, about the evergreen firs; atoms of life, light and drab, living on still more infinitesimal life. The Coal-tits are not far off, keeping their band together with pretty sweet calls,—though they may be caught occasionally at a frivolous by-play, as when the other day I heard a Coal-tit beguiled by cocky Chaffinch into a wordy war, the one bird's *spink* incessantly answered by the other's *teep*,—a game which absorbed the two for some time. Or else a rolling R-sound, minute as fairy's drum taps, tells the secret of the Long-tail's ambuscade, and with a little cautious spying the birds will soon be seen, more stationary than usual in the bushes at this season, perching with pendant tail, and enjoying a colloquy of *tr-r-r-r-r's* and *tick-ticks*. Or a *tap-tap* like the Woodpecker's call may be heard. Look up in the beech tree, and there is the Great-tit busy, opening with powerful beak the hard burr of the beech-nut. The Squirrel comes, too, after this year's bounteous harvest of mast, and so does the Jay. The Jay is cautious. We may hear his unmelodious voice above pretty often, but the rare vision we have of him shows a black-tailed, white-backed bird in the act of disappearance. He does not stay to be watched. The Marsh-tit also is not generally easy to observe. Perhaps a faint *zip-zip* gives the cue; and there he is! springing after insects about the gorgeous rose-bush that has not yet lost the fragile yellow leaves about its scarlet choops, beautiful as the bush, though not so bright, with his rich velvet cap above his pale throat and cheeks.

M. L. A.

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Edited by H.

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